TECHNICAL SPECIFICATIONS

GREEN POINT

10-15-20kVA single-phase / single-phase
10-15-20kVA three-phase / single-phase

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1 - OBJECTIVE

This technical document has been produced to be used by UPS system designers and installers.

The objective of this document is to provide and illustrate:

- the technical information required to enable you to choose the correct UPS to suit your needs
- the information required to set up and configure the system
- the information concerning the installation and location of the UPS
- the information the UPS displays locally to the user or to the monitoring systems it is connected to (E.g. control centres, etc.)
- a list of the possible options available to configure the UPS to the operators specific requirements

2 - DESCRIPTION OF THE SYSTEM

The GREEN POINT range of UPS has been designed to offer a high level of versatility and reliability.
Utilising the latest On Line double conversion (VFI) technology, meaning that the load is constantly supplied by the alternating current (AC) from inverter, the UPS first converts the alternating current from the mains supply into direct current (DC) and then back to AC again to ensure a perfectly sinusoidal, stable and filtered output in terms of voltage and frequency. The frequency and voltage are constantly monitored using microprocessor digital control, this control ensures true independence of the input power supply, with input and output filters that significantly increase the extent to which the load is protected from mains supply borne transients, current surges and noise. The GREEN POINT range is available in 10-15-20kVA single/single-phase or three/single-phase.

In terms of technology, performance (standard Economy Mode selectable), reliability, diagnostics (LCD display with 128 alarms as standard), RS232 interface, EPO input and slot for network interface, the GREEN POINT is the finest solution available for providing uninterruptible power to sensitive and vital “mission critical” loads and safety systems (electro-medical).
To enable easy installation, the single-phase output version can be connected to either a single or three-phase mains power supply.

The range

The GREEN POINT range consists of the following models:

MODEL	DESCRIPTION
GP 10000	10kVA three-phase or single-phase input (selectable) / single-phase output (only parallel configuration)
GP 15000	15kVA three-phase or single-phase input (selectable) / single-phase output
GP 20000	20kVA three-phase or single-phase input (selectable) / single-phase output

3 - APPLICATIONS

Personal computers
Small IT networks
Local Area Networks (LAN)
Workstations
Servers
Point of sale (POS) systems
Data centres
Industrial PLC's
Cash registers
Electro-medical equipment
Emergency devices (lights/alarms)
Telecommunications equipment
E.Business (server Farms, ISP/ASP/POP)

4 - CHARACTERISTICS

High levels of supply stability

The system provides a filtered, stable and reliable voltage (On Line double conversion VFI technology in accordance with European standard IEC62040-3) with filters for suppressing atmospheric and mains borne disturbances.

The On Line technology provides the maximum protection for the connected loads. The double conversion stage filters and stabilises the input voltage, and then reproduces it free of any disturbances such as overvoltages, variations in frequency and voltage, noise, etc.

The IEC62040-3 standard defines this technology as VFI (Voltage and Frequency Independent), meaning that the output voltage and frequency are completely independent of any variations or disturbances caused to the incoming mains supply.

High degree of protection against current surges (6KV in accordance with EN61000-4-5)
The GREEN POINT range has been tested by subjecting them to massive overvoltage and current surges on the input. The current surge used has a leading edge of 1.2 microseconds and a trailing edge of 50 microseconds, with the maximum energy of 300 Joules. The standard (EN61000-4-5) states that these current surges can reach up 6kV.

High levels of reliability and redundancy

Modular power supply: parallel connection

Maximum reliability and availability from the power supply, with the possibility to connect up to 8 systems in parallel, used to provide either redundancy (N+1) or total power. The range has been specifically designed to enable the user to install them in parallel with other systems of the same type, during the first installation or at a later date (retrofit).

The parallel system modification does not require the UPS to be manually calibrated in any way, the calibration of the systems is handled automatically by the microprocessor digital control system, this controls the exchange of information and ensures that the load distribution between the various UPS systems is equal. This method of control noticeably increases the overall reliability and efficiency of the system (it is common knowledge that most manually calibrated systems tend to degrade over time due to temperature or vibration).

The GREEN POINT can be connected in parallel to increase the total amount of power available from the system (known as a total power system) or to improve the level of reliability/redundancy, therefore if a fault occurs to one of the UPS systems the supply to the load will remain supplied by the operational system (known as a parallel redundant system).

"Digital" reliability

High level of UPS reliability (total microprocessor control).

The digital control system dramatically improves the overall reliability and efficiency of the UPS; resulting in a reduction in the number of electronic components required, the microprocessor controls and monitors all of the functions of the UPS from one common control card. The control card can be used across a number of various systems, even systems in different ranges, thereby increasing the productivity and reliability of the range.

Suitable for any type of load

The system is suitable for powering both IT or industrial loads, thanks to an output power factor of 0.8.

The UPS can provide an active power output rated at Pn x 0.8, and can therefore support industrial loads (which typically have a high power factor)

Low Power consumption

With an efficiency level of 92%, thanks to the digital control and IGBT technology. This technology enables the system to considerably reduce the energy wasted. In particular, thanks to the high switching speeds and low losses of the IGBT (Isolated Gate Bipolar Transistor) used in the inverter output stage, results in a high level of efficiency even at low loads (the efficiency is hardly effected with loads from 25 to 100% of the rated value). The reduced number of components within the system further helps to save energy.

"Economy Mode" and **"Smart Active Mode"** function (for increasing efficiency up to 98%)

Economy Mode:

Enables the user to select the Line Interactive (VI) technology, this mode provides power to non sensitive loads from the incoming mains supply for certain applications. In the event of a mains supply failure occurring the load is automatically switched onto the inverter for continued operation. This function can be programmed via the software or set manually from the UPS control panel. The voltage tolerance for this function can be set from ± 5% to ± 25% and the frequency from ± 1% to ± 5%.

Smart Active:

Enables the user to allow the UPS to determine which method of operation (on-line or line interactive) is suitable dependent on the quality of the incoming mains supply. If the mains supply is not within the acceptable limits for both voltage and frequency, the UPS will supply power to the load from the inverter

(on-line). When the mains supply returns to within the acceptable limits, the system will first ensure that the supply remains stable, before switching the load back onto the mains supply.

During both of these operating modes, the load is powered directly from the mains supply via the bypass. However, due to the EMI filters in both the input and output, the mains supply is filtered and therefore free of any electrical disturbances.

If the incoming mains supply fails, the load is supplied directly by the inverter. This function reduces energy consumption as when the mains supply is present, the inverter is off.

Flexibility of operation

Daily timer:

Enables the user to configure the UPS operational times on a daily basis, thus optimising the power consumption with respect to the time of day and importance of the load applied. This is configurable from the control panel or via software.

Emergency Stand-by function

The GREEN POINT can function as an emergency stand-by device. This particular operating mode is configurable from the control panel, and enables the supply to emergency lighting. The UPS remains off under normal operating conditions and only activates the output when the mains power supply fails.

The inverter switches on within 320ms in accordance with the current regulations, which stipulates a maximum delay time of 500ms, the inverter starts up gradually, thus preventing any sudden current surges.

This operating mode enables considerable energy savings, as the inverter is off under normal conditions and therefore does not consume any energy. In addition, the system does not need to be over-sized, as the gradual start up of the inverter prevents any current surge problems that might otherwise occur.

Auto-off function:

This function is programmable from the front control panel, and enables the system to automatically switch the load onto the by-pass line when the connected load on the UPS falls below a preset value (configurable). This mode reduces the energy wasted by switching the inverter stage off when the system is powering non-critical loads. When the load is increased the UPS returns to on-line mode. This function is also useful for avoiding unnecessary deep battery discharges, where there is no load connected during a mains supply failure.

Frequency auto sensing:

The UPS automatically selects the output frequency based on the input frequency (50 – 60 Hz)

Frequency converter function:

The UPS can be configured to function as a frequency converter, therefore when the input frequency is 50Hz the output frequency can be 60Hz and vice versa. During this mode of operation the automatic by-pass is deactivated.

Auto-Restart:

The UPS can be configured to automatically restart after a mains supply failure or after the batteries have become fully discharged. The Auto-Restart function may be delayed using the built-in software.

Cold Start (no battery):

Enables the UPS to be switched on during the absence of the mains supply (optional).

Low impact on the mains power supply

Power factor correction (UPS input factor close to 1):

The UPS absorbs power from the incoming mains supply with a power factor close to 1, even if the systems supplied by the UPS have a power factor inferior to this. For example, if the UPS supplies a piece of IT equipment with an input power factor of 0.65, the UPS input power factor will still remain close to 1, ensuring that any mains supply power factor correction banks are not overloaded.

Sinusoidal absorption (option)

The UPS draws a sinusoidal current from the mains supply, meaning that the system has a very low impact on the mains supply and, as a consequence, on the other pieces of electrical equipment connected to it.

Maximum battery reliability

The system compensates for any variations in temperature whilst recharging the batteries, as temperature represents the greatest threat to the overall life and performance of the batteries. The recharge voltage is temperature dependent – the higher the temperature, the lower the recharge voltage will be. This system ensures that the batteries operate effectively, efficiently and prolongs their life.

High level of battery reliability **(automatic battery test)**.

The UPS carries out battery tests automatically; these tests enable the system to periodically check the efficiency of the batteries in order to prevent any faults occurring to them. The test does not in any way compromise the supply to the connected equipment, and given the short duration (seconds), it does not affect the life or the back-up time of the batteries.

The period between and the duration of the test can be configured via the control panel, or the test can be completely deactivated.

The batteries are also **protected against prolonged slow discharge.** An electronic device automatically disconnects the batteries if the discharge period is too long (for example when the UPS is operating on back-up either with no load or with very low loads). This protects the batteries from discharging completely, which inevitably accelerates the ageing process.

Reduced noise:

The use of high speed IGBT switching technology and controlled ventilation in relation to temperature and load applied, ensures a very low operational noise with very little impact on the surrounding environment.

Complete self diagnostic capability

The internal event log providing 128 signals, status and alarms all via the standard multilingual LCD display.
The information provided enables the user to accurately identify any problem relating to the system or to the operating environment (variations in the mains, overtemperature, overloads, etc.).

Easy to install and maintain

Simplified installation:

The UPS can be connected to either a single-phase or three-phase power supply without any internal modifications necessary.

Castors to ease installation, movement and maintenance of the system .

Adjustable output voltage via the control panel. This enables the output voltage from the system to be increased to compensate for the drop of voltage through the cables to the load, guaranteeing the rated voltage to all users. This is particularly important in systems that require long supply to load cables.

External manual By-Pass:

The UPS can be connected to an external manual by-pass system, therefore the external by-pass can be integrated and monitored by the UPS.

Compact dimensions and quick maintenance (reduced MTTR):

Simplified access to the electronics and power components.

The internal batteries (models 10-20kVA) can be easily accessed from the front of the system, and therefore can be easily checked, tested or replaced without the need to access them from the side or rear.

As there is no requirement to provide a space at the side or the rear of the system to perform maintenance work, a reduction in the overall size of the system is achieved .

Further space saving is achieved due to the front to rear ventilation.

Advanced Communication

Monitoring and shut down software included

Greenshield provides an efficient and intuitive system for controlling and monitoring the UPS, displaying all of the most important information, such as input voltage, applied load, battery capacity, etc. using a series of bar charts.

The software is able to provide detailed information even if the UPS has malfunctioned, enabling the user to find out why the fault has occurred and when.

Greenshield has been developed using a client/server architecture that renders it flexible and easy to use, with multilingual support and on line help.

The Greenshield software is provided free of charge with an SNMP agent, this version will operate on Windows 95, 98, 2000, Windows 2003 Server, Me, Xp, NT4.0, Novell, Mac OS, Mac Osx, Mac Os 9.x & Linux operating systems.

The software enables the user to programme the automatic start-up and shutdown of the system on a weekly basis.

The UPS also contains the following hardware interfaces:

- double RS232 serial port
- voltfree contacts interface
- slot for the installation of a network adaptor
- EPO (Emergency Power Off) contact for UPS emergency power off using a remote emergency button.

5 - REFERENCE STANDARDS

5.1 Main reference standards

The company quality system has been certified as conforming to ISO 9001 (Certificate ITALCERT No. 005/03). This covers all of the procedures, operating methods and controls from the design stage to production, sales, through to the after sales service support.

This certification guarantees the following aspects to our customers:

- the use of quality materials
- rigorous standards in production and testing
- receptiveness and openness to our customers
- constant support of all our customers

As well as conforming to this certification, the company also produces “state of the art” products, as dictated by the requirements of the standards quoted below.

The advances that have taken place in Information Technology systems, means that the power systems used to power them must be able to provide an absolutely precise, and even more importantly, absolutely reliable source of power. The standards produced by **IEC/CENELEC** in the **IEC/EN62040** series, cover all aspects of the product: safety, electromagnetic compatibility and performance.

STANDARDS

EN62040-1:
Uninterruptible power supply systems (UPS): general provisions and safety provisions

EN62040-1-1:
Uninterruptible power supply systems (UPS): general provisions and safety provisions used in areas accessible to the operator

EN60950 (CEI74-2):
ITE (Information Technology Equipment) safety

EN50091-2:
Uninterruptible power supply systems (UPS): electromagnetic compatibility provisions.

EN50081-2:
Electromagnetic compatibility (immunity)

IEC61000-4-2:
Immunity: Electro Static Discharge (ESD)

IEC61000-4-3:
Immunity: electromagnetic fields

IEC61000-4-4:
Immunity: transient overvoltages (BURST)

IEC61000-4-5:
Immunity: current surges (Surge)

IEC61000-4-11:
Low frequency disturbances

EN50141:
Induced radio interference

EN55022:
Radio frequency disturbance

EN62040-3
Uninterruptible power supply systems (UPS): performance provisions and test procedures.

EN50171:
Central supply systems for emergencies (CSS)

IEC146 (CEI22):
Semiconductor electronic converters

IEC529 (CEI70-1):
Degree of protection of casings

European Directives

73/23
Low voltage directive enforcing use of the CE marking from 1/1/97. This directive concerns all issues of safety associated with the equipment.

89/336
Electromagnetic compatibility directive enforcing use of the CE marking from 1/1/96. This directive concerns all issues of immunity and emissions relating to the UPS once installed.

5.2 Standards relating to systems and installation

The above product regulations refer specifically to uninterruptible power supply systems. It is these regulations that manufacturers of uninterruptible power supply systems are obliged to adhere to. However, with regard to the electrical system, the installer must refer to other standards.

- standard **CEI 64-8** (HD384/IEC60364)
  for electrical systems in general

- standard **CEI 64-8/7 variant 2**:
  for installation in hospital environments

- standard **CEI 11-20**:
  for systems with UPS machines connected to category I or II networks

- standard **CEI 17-13 (EN60439-1)**
  relating to control equipment

- standard **CEI 21-6/3 (EN50272)**:
  for battery installation

- **CEI 20**:
  for electrical cables

6 - INSTALLATION INSTRUCTIONS

6.1 Electrical system requirements

6.1.1 Protections

UPS INTERNAL PROTECTION

The size of the circuit breakers and fuses positioned in the UPS input/output lines are shown in the table below (refer to the block diagram section for an explanation of the abbreviations). Any fuse that requires replacement must only be replaced with a fuse of the same type and rating, as indicated in the table below.

UPS with SINGLE-PHASE OUTPUT:

	Switches and Internal Protections						
UPS Type	**Non-automatic switches**		**Fuses**				
[kVA]	UPS Input	UPS Output / Maintenance	Rectifier Input Fuse	Battery Fuse	Bypass Fuse	Input Current [A]	Output Current [A]
	SWIN	SWOUT/SWMB		FBAT	FBY	Max	Rated
10	63A (4P)	63A (2P)	20A gR(10x38)	30A gR(10x38)	50A gR(14x51)	51	43
15	100A (4P)	100A (2P)	30A gR(10x38)	30A gR(10x38)	63A gG(22x58)	67	65
20	100A (4P)	100A (2P)	30A gR(10x38)	30A gR(10x38)	100A gG(22x58)	74	87

UPS INPUT PROTECTION

When installing the UPS input protection devices, the maximum current drawn will be dependent on the operational mode of the system when a fault occurs, therefore the following two operational modes must be taken into account.:

- During “NORMAL OPERATION”, the power to the load is supplied by the mains input via the converter, and therefore the maximum input current drawn is that shown in the table above (under the heading “Input current max) .
- During “BYPASS OPERATION”, the power to the load is supplied directly via the by-pass line, therefore the maximum input current drawn is limited by the rating of the bypass fuse shown in table above (under the heading “Bypass fuse FBY).

Differential (Residual Current Device (RCD))

In the standard version, where no input isolation transformer exists, the mains supply input neutral is connected to the UPS output neutral. The UPS does alter the arrangement of the neutral regime within the system, as a result, the electrical systems both up stream and down stream are identical.

Additional differential (RCD) devices may be installed on the output of the UPS, corresponding to those installed on the input.

The differential devices installed on the system input must have the following characteristics:

- A differential current of not less than 100mA (to avoid nuisance tripping)
- type A or type B with delay equal to or greater than 0.1 s

The UPS rated output current is indicated in the previous table (under the heading "Output current rated")

UPS OUTPUT PROTECTION, SHORT CIRCUIT AND DISCRIMINATION

Short circuit

During a fault within the load or a short circuit, the UPS will limit the amount and the duration of the current supplied (current limited), in order to protect the UPS inverter output (short circuit current).

The amount of current available will depend upon the operating mode of the UPS at the time of the fault.

UPS in Normal Operation mode: The load is instantly switched onto the by-pass supply, thus guaranteeing the values indicated in the technical data section, before the FBY fuse(s) intervenes.

UPS in Battery Operation mode: The UPS protects itself by supplying an output current of approximately 2 times the rated current for 0.5s.

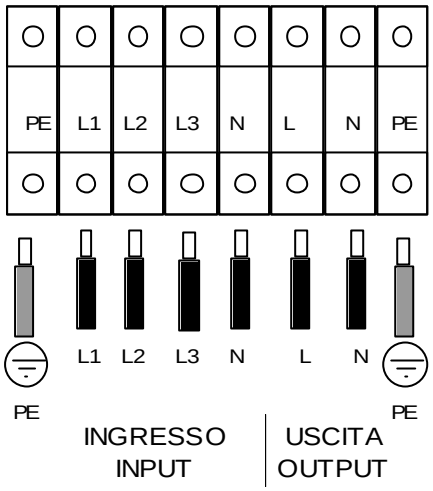
Discrimination

The following table provides an indication as to the maximum rating and type of fuse that can be discriminated by the UPS, the table contains two values for each size of UPS, the recommended fuses are dependent on the operational mode of the UPS when the fault or overload occurs, these being either Normal Operation or Battery Operation.

UPS with single-phase output

kVA Rating	10		15		20	
Max output fuse size & type [A]	gG	aM	gG	aM	gG	aM
Discrimination in Battery Operation mode	10	6	16	8	20	10

CONNECTING THE SUPPLY AND LOAD



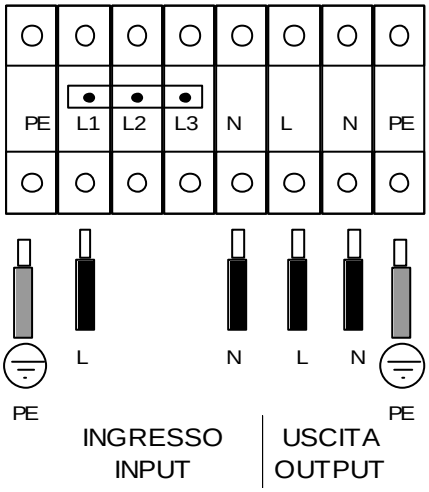
UPS with single-phase output (three-phase + neutral input)

Refer to the table below for the recommended cross sectional area of the input and output cables. The figures within the brackets are the maximum sizes that may be connected to the system terminals.

Size. [mm²]					
	INPUT			OUTPUT	
kVA	L1	L2/L3	N	PE	L1/N
10	10(50)	4(50)	10(50)	10(50)	10(50)
15	16(50)	6(50)	16(50)	16(50)	16(50)
20	25(50)	10(50)	25(50)	25(50)	25(50)

UPS with single-phase output (single-phase input)

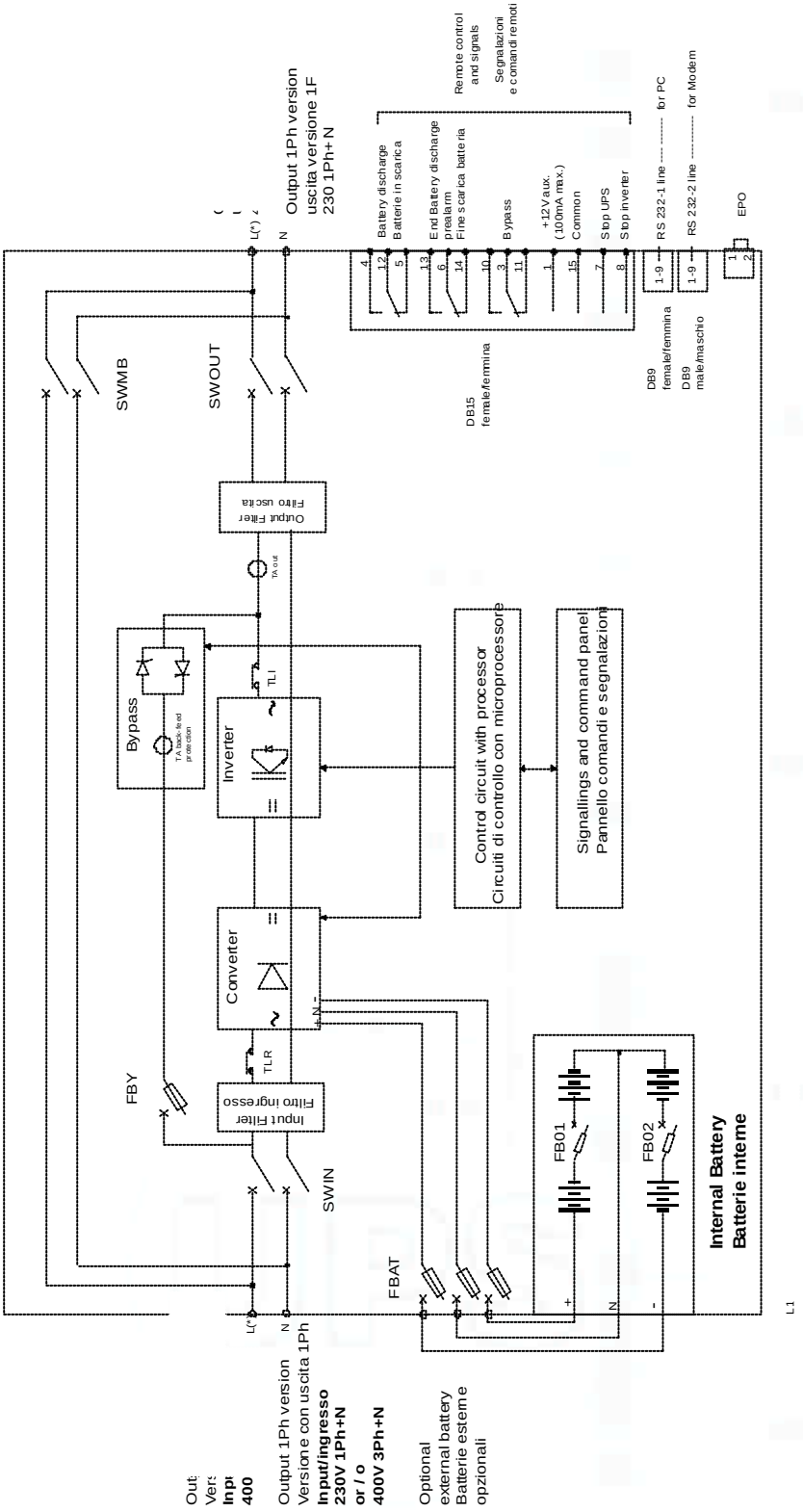
To operate the UPS with a single-phase input, the jumper (supplied) must be fitted across the three live input terminals (L1, L2, and L3) as shown below.
Refer to the table below for the recommended cross sectional area of the input and output cables. The figures within the brackets are the maximum sizes that may be connected to the system terminals.



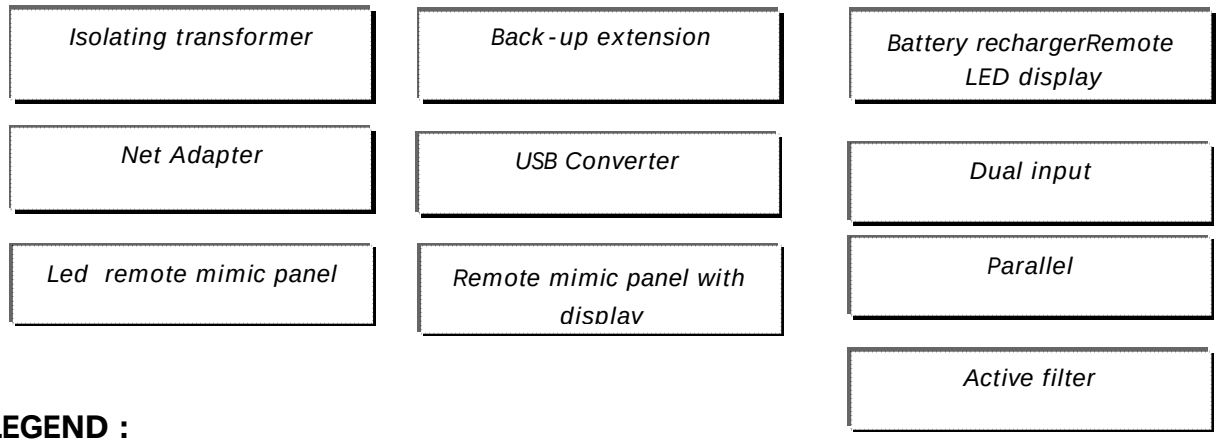
Size. [mm²]				
	INPUT		OUTPUT	
kVA	L1	N	PE	L1/N
10	10(50)	10(50)	10(50)	10(50)
15	16(50)	16(50)	16(50)	16(50)
20	25(50)	25(50)	16(50)	25(50)

7 - SYSTEM BLOCK DIAGRAM

> 7.1.1 Block diagram of the UPS 10÷20kVA



7.2 Options



LEGEND :

1) Automatic By-Pass:

The automatic by-pass is an SCR (static) device that automatically switches the UPS output onto the incoming mains supply in the event of an overload and/or a fault within the UPS.

Due to the SCR technology used, this operation occurs without any interruption in the supply to the load. The system is equipped with an auxiliary redundant power supply to receive power even if the primary power supply malfunctions.

2) Output contactor

The output contactor can automatically disconnect the UPS inverter output from the load in the following scenarios:

a) During Line interactive mode (economy or Smart Active Mode)
b) During by-pass mode whilst on-line
c) If a fault occurs with the inverter or if the Emergency Power Off (EPO) button is pressed.

3) Battery charger

A typical recharge takes between 6 and 8 hours depending on the initial charge state of the batteries and the size of the installed battery charger. The battery charger is deactivated when there is no mains supply present.

During the battery recharge cycle by the dedicated battery charger, the voltage and current are perfectly filtered and stabilised, free from any alternating components (ripple) that may damage the efficiency or the life of the batteries.

In addition, the battery recharge is temperature compensated. The greater the temperature, the lower the recharge voltage, as recommended by the battery manufacturers, which considerably prolongs the overall life and efficiency of the batteries.

4) Interface

The UPS is equipped with two RS232 interfaces, volt free contacts, input signals (by-pass and isolated

emergency power off (EPO) as standard (see interface section)

5) Slot for network interface or other communications cards

The expansion slot enables the user to insert additional communications devices such as SNMP interfaces (network adaptor card) or an auxiliary RS232 interface card/duplexer.

6) Control and display panel

The control and display panel provides the user with all of the visual (LED and LCD) and acoustic (buzzer) signals regarding the operational status of the UPS. This panel also enables full control, monitoring, diagnosis and personalisation of the UPS through the easy-to-use menu system accessed on the panel (refer to the control panel section).

7) Input/output filters

During Normal Operation, the input/output filters eliminate high frequency disturbances and protect both the UPS and the connected loads from any mains borne disturbances. These filters also ensure that any disturbances created by the UPS or the connected loads do not affect any other user.

During both “Line interactive” and “By-pass” modes, the filters ensure that the connected loads are constantly protected against disturbances from the mains power supply.

8) Converter (input stage)

During Normal Operation mode, the converter changes the mains AC voltage into a constant DC voltage, suitable for both the inverter and the battery charger. When the mains supply is absent, it takes power from the batteries, to provide the inverter with a constant voltage.

In the single-phase output versions the converter may either be connected to a 230V single-phase supply or 400V three-phase with neutral supply. The option of either a single or three-phase power supply can be made during the installation.

The converter operates as a PFC (Power Factor Correction) device, providing an input power factor close to 1. The UPS therefore has a correction element, which directly benefits the electrical system, therefore no correction capacitors are required.

9) Inverter (output stage)

The inverter converts the direct current into a stable sinusoidal alternating current, which is used to power the load. The load is always powered by the inverter when the UPS is in “on line” mode.

The inverter is single-phase , based on IGBT (Isolated Gate Bipolar Transistor) technology. The IGBT enables high switching frequencies (up to 20kHz) thus reducing power consumption and audible noise levels (n general, noises above a frequency of 16KHz are practically inaudible to the human ear).

10) Static by-pass

This device automatically switches the power supplied to the load between the inverter and the by-pass line and vice versa. It consists of static (SCR) components that ensure zero switching time.

The static bypass can support overloads greater than those supported by the inverter and enables the load to be powered even if an internal fault within the UPS occurs.

The bypass has one fused at the input to the UPS.

11) Back feed protection

The back feed protection is installed in series with the bypass SCRs. When the mains power supply fails, and in the event of a fault occurring with the SCRs, the back feed protection device prevents any current that could cause an electric shock from back feeding to the incoming power supply connections.

Furthermore, when a mains supply failure occurs, an electromagnetic switch positioned at the rectifier input opens, thus preventing any current back feed onto the electrical system prior to this point.

This device must be installed in electrical systems in accordance with the new CEI 11-20 regulation (I and II category systems). This enables the user to work on the incoming power supply, after the power supply to the UPS has been switched off via the supply isolator, and therefore no risk of any current back feed occurring from the UPS.

12) SWMB (Maintenance by-pass), SWIN, SWOUT

The SWMB maintenance bypass switch directly connects the input to the UPS to the output load, thus bypassing the internal sections of the UPS, the switch connects all of the incoming conductors (including the neutral) to the corresponding output conductors without interruption to the load. Whilst the SWMB switch is closed, the SWOUT, SWIN and FBAT switches can be opened, which enables the user to safely carry out maintenance work within the UPS, whilst power to the load is maintained.

This method of operation is necessary for UPS systems of a certain size, where maintenance work is often carried out on site, and therefore supplied as standard within the UPS.
The maintenance by-pass switch enables the load to be continually supplied, without altering the electrical system. The bypass switch can also be used to re-connect power to the connected load in an event of an emergency for whatever reason (overloads, high ambient temperature, total failure etc.), and can be left switched on until such time as the UPS resumes normal operation condition.
The manual by-pass line is sized in accordance with the rated output of the UPS.
The UPS also enables the integration of an external maintenance bypass switch, therefore when the external bypass is activated the UPS can report the condition and take the appropriate action.

7.3 Operating modes

The UPS can be configured to operate in one of the three general operating modes:

- ON-LINE;
- STAND-BY ON (equivalent to line interactive mode).
- Stand-by

The “Battery Operation mode”, “By-pass Operation mode” and “Maintenance By-pass Operation mode” are common to all three of these system configured modes.

ON - LINE

With the factory default setting, the UPS goes into ON LINE mode when switched on.

Display message	Power supply	SWIN	FBY	FBAT	SWOUT	SWMB	Led BATT	Led IN	Led OUT	Led BY	Buzzer
NORMAL OPERATION	ok	on	on	on	on	off	off	on	on	off	off

MAINS present and load powered.

The load is constantly supplied by the inverter with a stabilised and regulated voltage and frequency. If a fault with the incoming mains supply occurs the UPS will instantaneously switch over to batteries, which provide the power to the inverter and therefore maintains the power supply to the load. The battery is then automatically recharged when the mains supply returns.

During either of these two operational conditions the inverter constantly supplies power to the load with a stabilised and regulated voltage and frequency, ensuring that the load has a high degree of immunity to disturbances etc, due to the double conversion. In the event of mains failure, no disruption in the supply to the load will occur as the transfer is instantaneous.

STAND-BY ON

The STAND-BY ON mode and the by-pass line tolerance range must be set using the control panel.

The standby-on function reduces the energy dissipated by the system

Display message	Power supply	SWIN	FBY	FBAT	SWOUT	SWMB	Led BATT	Led IN	Led OUT	Led BY	Buzzer
NORMAL OPERATION MODE STBY=ON	ok	on	on	on	on	off	off	on	on	on	off

The Converter remains active and the batteries are kept charged:

The switching time between the inverter and the by-pass line can be either set to immediately (Economy Mode), or delayed up to a maximum of 180 minutes (Smart Active Mode). For the system to switch the load onto the by-pass line, the bypass supply must be within the configured acceptable range for the pre determined time set.

The system remains on the by-pass line for as long as the voltage and frequency fall within the acceptable predetermined range. The input “IN” (green), output “OUT” (green), by-pass “BY”(yellow) LEDs are permanently lit on the display panel.
During this operating mode, energy dissipated is significantly reduced (efficiency = 98%)

If the by-pass line fails or the voltage or frequency exceed the acceptable range, the load is automatically switched onto the inverter output.

STAND-BY FUNCTION:

The UPS can be programmed to operate in stand-by mode. During this mode, the UPS output remains off whilst the mains supply is present and activates only when the mains supply fails.

The inverter start up is progressive (320 msec), to prevent current surges occurring due to loads such as lights etc.

8 - INTERFACING

8.1 Remote signals and command connectors

The following connectors are situated on the rear. Refer to the "VIEWS OF THE UPS" section for details.

1 x EPO (emergency power off) connection point;
1 x DB15 female REMOTE;
1 x DB9 male RS232-1;
1 x DB9 female RS232-2;
1 x Aux Slot for SNMP card etc.

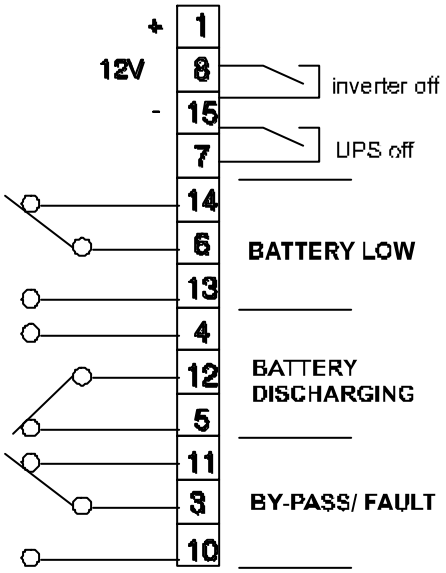
8.2 EPO (Emergency Power Off command)

The EPO operates a normally closed system and by opening the link will force the UPS into an emergency power off command.
Using this input, the UPS can be shut down remotely in the event of an emergency by pressing a single emergency button. The EPO switches the UPS off which will remain in this state until reset.

8.3 DB15 Female "Remote"

This connector consists of:

1 x 12Vdc 80mA(max) power supply
3 x voltage-free alarm contacts
2 x Inverter and UPS shutdown commands



The pin layout is as follows (see figure):

BATTERY LOW = END OF DISCHARGE PRE-ALARM (the low battery warning time can be configured)

BATTERY DISCHARGING = BATTERY DISCHARGING (mains failure)

BY-PASS / FAULT = BY-PASS/FAULT
The position of the contacts shown is during a non alarm state (NORMAL OPERATION).

The contact rating is 42V @ 0.5A(max).

REMOTE COMMANDS
2 commands are available:

BYPASS with **INVERTER STOP**– by connecting pin 8 to pin 15 (for at least 2 seconds) used for external bypass commands.

TOTAL STOP – by connecting pin 7 to pin 15 (for at least 2 seconds) the system will shut down.

8.4 DB9 female “RS 232-1” PC connection

Can be used to connect the UPS to a computer 9 pin DB9 type male connector. The UPS transmission protocol preset by the factory is as follows: - 9600 baud, - no parity, - 8 bit,- 1 stop bit.

The transmission speed can be configured using the CUSTOMISATION menu on the panel from 1200 to 9600 baud.

Recommended transmission speeds in relation to transmission distance:

9600 baud 50m, 4800 baud 100m, 2400 baud 200m, 1200 baud 300m

To connect the UPS to a PC, use a shielded pin to pin cable (AWG22÷28) and only connect the shielding to the computer end.

8.5 DB9 male “RS 232-2” MODEM connection

Can be used to connect the UPS to a Modem. 9 pin DB9 type male connector. The transmission protocol preset by the factory is as follows: - 9600 baud, - no parity, - 8 bit,- 1 stop bit.

The transmission speed can be configured using the CUSTOMISATION menu on the panel from 1200 to 9600 baud.

Recommended transmission speeds in relation to transmission distance:

9600 baud 50m, 4800 baud 100m, 2400 baud 200m, 1200 baud 300m

To connect the UPS to a PC, use a shielded pin to pin cable (AWG22÷28) and only connect the shielding to the computer end.

9 - OPTIONS

9.1 Summary table of the options available

Description	Dimensions (HWD) mm	Weight (Kg)
Isolating transformer module 400V two-phase or 230V single-phase, output 230V single-phase 10 kVA	1200x555x750	140
Isolating transformer module 400V two-phase or 230V single-phase, output 230V single-phase 15 kVA	1200x555x750	160
Isolating transformer module 400V two-phase or 230Vsingle-phase, output 230V single-phase 20 kVA	1200x555x750	188
Remote LED display		
Remote LCD display		
Communication software		
Parallel kit (one per machine)		
Active Filter (THDi <4%)		

ISOLATING TRANSFORMER MODULE:

Enables the UPS input to be galvanically isolated from the output.
Also enables the change the neutral arrangements (from TT to TN, or from TT to IT, for example) to increase the continuity of the power supply (IT system), or to increase the level of protection of the users (TN system).
The transformer may be connected to the UPS input (single-phase/single-phase or three-phase/three-phase version) or to the output (three-phase/single-phase version).

REMOTE LED DISPLAY:

Can be connected at a distance of up to 200m from the UPS, enabling the user to view the general status of the UPS remotely in real time.
The remote display indicates the operation of the system:

- green LED: normal operation
- yellow LED: non critical alarm
- red LED: alarm

The remote display also enables the sending of both the UPS switch on or the shutdown commands remotely.

REMOTE LCD DISPLAY

The remote LCD display replicates the control and display panel of the UPS, therefore full control and interaction with the UPS is possible remotely.

9.2 - Communication software

MAIN CHARACTERISTICS

1) Sequential and prioritised shutdown:

Greenshield enables the user to shutdown the network without having to individually switch off each PC or server, and before doing so, Greenshield will save the work that was being done regardless of the application that was being used. The user may also define their own shutdown procedure and also prioritise the shutdown of critical components within the system (such as vital and non vital servers).

2) Multiplatform compatibility:

Greenshield provides the user with a standard control and monitoring capability, using TCP/IP communication protocol.
This enables the user to monitor computers that use different operating systems from a single console. For example, not only could the user monitor a UNIX server from a PC with Windows 98, the user could also connect to UPS systems situated in different locations by using either a dedicated network (intranet) or the Internet.

3) Events scheduling:

Greenshield enables the user to define their own shutdown/switch off and on procedures, for the systems that are connected to the UPS. Not only does this noticeably increase the degree of security of the system, it also enables the user to make significant energy savings.

4) Message management:

Greenshield keeps the user constantly informed of the status of the UPS, whether locally or by sending messages to users connected to the network. It is also possible to create a list of the people who will receive messages by e-mail, fax and SMS should a fault or sudden blackout occur.

5) Integrated SNMP agent:

Greenshield contains an integrated SNMP agent for managing the UPS via SNMP. This agent is able to send all of the information regarding the UPS and is capable of generating traps using the RFC 1628 MIB standard.
This enables the user to control the UPS using SNMP compatible workstations such as HP Open View, Novell Managewise and IBM NetView.

OPERATING SYSTEMS SUPPPORTED

- Windows 95, 98, Me, NT 4.0, Win 2000, Win 2003 Server, XP.
- Novell Netware 3.x, 4.x, 5.x, Intra NetWare
- IBM OS/2 Warp and Server,
- Mac OS, 9.X, OSX
- The most commonly available UNIX systems such as:

IBM AIX, HP UNIX, SUN OS SPARC, SUN Solaris INTEL and SPARC, SCO Unix and UnixWare, Siemens SINIX, Silicon Graphic IRIX, Compaq True64 UNIX and DEC UNIX, Linux, BSD UNIX and FreeBSD UNIX

GREENSHIELD SOFTWARE FUNCTIONS

1) Graphical monitoring of the UPS status

Greenshield is the easy to use yet powerful program that enables the user to monitor and control the UPS systems.
There are various graphical versions including Windows, Java, OS/2 and MacOS.

2) MACOS version

The Greenshield software is the only UPS control and shutdown software available for the Macintosh that has a client-server architecture.
Enabling the user to access the Windows, Novell, IBM OS/2 and the most commonly available UNIX operating systems, when using a TCP/IP network.
It also enables the user to support the NetMan series network agents to control the UPS via a network, and furthermore, comes with multilingual support.

3) Detailed display of all the UPS data

Greenshield provides all the data required to make an accurate and swift assessment of the UPS operation and status.

4) Block diagram and operating diagram of a UPS

Greenshield displays a block diagram of the UPS, thus providing the user with conceptual information as to the status of the system.

5) Automatic saving of the events log and graphical display

All of the events regarding the operation of the UPS are saved and recorded, thus allowing the user to monitor such data as the input voltage, applied load or the remaining back-up time available from the batteries.

6) Alarm notification via E-MAIL and SMS

It is possible to configure Greenshield to automatically notify of an alarm via an e-mail or SMS message.

7) Programming the UPS commands

Enables the user to program all of the commands that would normally be carried out manually, to be performed automatically, for example: shutting down or switching the servers back on, UPS battery test, etc.

10 - CONTROL / DISPLAY PANEL

10.1. LED Panel

BUTTONS
1. Help/Language selection
2. Measurements
3. Commands / selection / customisation
4. Events log
5. Audible alarm On/Off
6. Time / date
7. Scroll back
8. Scroll forward

Control / Display panel (10-20 kVA models)

Information on the UPS operating status is provided by:

- a Liquid Crystal Display (LCD), with variable contrast and two lines of 40 characters.

- four LEDs

"IN"	power supply and by-pass line input
"OUT"	inverter output
"BY"	by-pass line output
"BATT"	battery input

- an acoustic signal.

LEDs

The LEDs can be either lit, flashing or off, thus providing immediate information on the UPS status.

IN LED (green): input supply.

Lit:	The input supply is within a preset range (voltage or Frequency);
Flashing:	The input supply is not within a preset range (voltage or Frequency);
Off:	No input supply present.

OUT LED (green): inverter output line.

Lit:	The UPS output is supplied by the inverter, if the BY (yellow) is also lit, the UPS is in Stand by mode.
Flashing:	UPS output is supplied by the inverter with a load >100% or the SWMB switch is closed.
Off:	When the system output has been switched onto the automatic internal by-pass line, or the SWOUT switch is open.

BY LED (yellow): automatic by-pass output line.

Lit:	When the system output has been switched onto the automatic internal by-pass line.
Flashing:	When the output load is greater than 100%VA, or when the manual by-pass SWMB switch is closed.
Off:	When the system output has been switched onto the inverter or when the EPO command is active.

BATT LED (yellow): battery line.

Lit:	When the batteries are supplying power to the inverter.
Flashing:	When either the "BATTERY VOLTAGE LOW PRE-ALARM" or the BATTERIES DISCHARGED alarm OR SWB OPEN are active.
Off:	When the UPS is on and the batteries are charged or charging.

Acoustic signal

The buzzer can be activated or deactivated, with preferences saved to memory.
The buzzer sounds intermittently at 2 seconds intervals whenever there is an alarm of any kind.
The buzzer sounds continuously when the BATT LED (end discharge pre-alarm) flashes.

10.2 Liquid Crystal Display (LCD)

LCD display: status messages

During Normal Operation mode, where no specific information has been requested and/or no particular command has been made using either the buttons on the control panel or via the RS232 remote line, the LCD will display a number of basic messages.

It is possible to obtain further information, or perform commands, by accessing the sub-menus using buttons 1 – 8 of the control panel and following the instructions that appear on the screen.

10.3 List of the information output on the LCD display:

Selections

- Help
- Language selection (Italian – English – French – German - Spanish - Dutch - Swedish – Polish)

Measurements:

input voltage
input power
by-pass frequency
output frequency
output peak power
battery peak pulse current
inverter input voltage
inverter operation time
battery operation time
no of complete discharges
input frequency
by-pass voltage
output voltage
output power
battery voltage
battery discharge current
internal temperature (system/converter /bypass/inverter/magnetic components)
by-pass operation time
no. of battery interventions
date of first activation

Commands

battery test
by-pass off
system off
display contrast
end discharge pre-alarm

Customisation

output voltage
batteries
end discharge pre-alarm
by-pass voltage tolerance
modem
output voltage compensation
line-interactive operating mode
auto off
by-pass frequency tolerance

Event Log

Enables the user to view up to 120 previous events . For each event, the measurements taken and alarms active when the event occurred can also be seen.

10.4 Alarm messages

The alarm messages that appear on the first line of the display panel are listed below. The alarm number in brackets indicates the level of priority.

[1] DISTURBANCES ON THE BY-PASS LINE

This alarm is present whenever there is a disturbance on the by-pass line (such as a voltage peak or harmonic distortion, whilst the voltage and frequency are correct).

[2] BY-PASS MANUAL, SWMB - ON or cable fault

The manual by-pass switch, or SWMB, has been switched on, preventing the system from returning to normal operation. The load is powered by the by-pass line input and is not protected by the UPS.

“Cable fault” only refers to those UPSs that have been connected in parallel. The processor has detected an error in the communications signals exchanged between the UPS systems connected in parallel and has therefore switched the entire system on to by-pass mode.

[3] BY-PASS VOLT. FAIL or SWIN, FBY OFF

This alarm is present if :

- the voltage on the by-pass line input is incorrect.
- or the SWIN input switch is open.
- or the fuse on the by-pass line is open or failed.

[4] MAIN LINE VOLTAGE FAIL or SWIN OFF

The incoming mains supply voltage is incorrect and the battery is therefore powering the load.
This alarm is present if one of the following conditions occurs:

- the voltage or frequency of the converter supply line are not within acceptable limits (see general characteristics).
- SWIN switch is open.

[5] PRE-ALARM, LOW VOLTAGE ON BATTERY

This alarm is present if:

- the battery voltage is less than the amount required to provide approximately 5 minutes of back-up (this time is configurable).
- or the residual back-up time is less than the amount that has been set.

[6] BATTERY DISCHARGED or FBAT OPEN

The UPS has performed a battery test while the mains supply is present and the result is negative.

[7] LOW VOLT. SUPPLY or OVERLOAD [W]

This alarm is present if one of the following conditions occurs:

- the incoming mains supply voltage is insufficient.
- the output load, measured in active power [W], exceeds the rated value.

[8] OUTPUT OVERLOAD

Indicates that the power drawn by the load and provided by the inverter exceeds the permitted value. The value indicated, expressed in %VA, exceeds 100%.

This alarm is activated whenever the peak current absorbed by the load exceeds the maximum value permitted.

When this alarm occurs the load should be reduced immediately. Otherwise the system will switch the load onto the by-pass line, with a time delay inversely proportional to the size of the overload.

[9] BY-PASS FOR VA OUTPUT < AUTO-OFF VALUE

This alarm is activated whenever the power measured in %VA drawn by the load is less than the "AUTO-OFF" value that has been set.

The %VA AUTO-OFF value is set to zero by the manufacturer (thereby disabling this alarm).

[10] INTERNAL FAULT: number

The various faults indicated are:

INTERNAL FAULT 1 - Precharge circuit fault
INTERNAL FAULT 2 - Inverter
INTERNAL FAULT 3 - Inverter output contactor failure
INTERNAL FAULT 4 - Booster output voltage
INTERNAL FAULT 5 - SCR on bypass line
INTERNAL FAULT 6 - Input contactor failure
INTERNAL FAULT 7 - Internal power supply error on the control board
INTERNAL FAULT 8 - Battery charger high voltage
INTERNAL FAULT 9 - SCR battery
INTERNAL FAULT 10 - Fault on parallel signal circuits
INTERNAL FAULT 11 - Switching on inverter failure
INTERNAL FAULT 20 - DC output voltage failure
INTERNAL FAULT 21 - A UPS operating as slave has distorted current flow
INTERNAL FAULT 22 - Parallel slave UPS has a different software version
INTERNAL FAULT 23 - Parallel UPS with different number of output phases
INTERNAL FAULT 24 - Transmission error from parallel master UPS
INTERNAL FAULT 25 - UPS previously activated in parallel mode
INTERNAL FAULT 26 - Switch over to bypass line failed
INTERNAL FAULT 27 - Failure on bypass SCR power supply
INTERNAL FAULT 28 - Input circuit with active filter failure
INTERNAL FAULT 29 - Active filter communication failure
INTERNAL FAULT 30 - Failure on temperature sensor
INTERNAL FAULT 31 - Microprocessor failure

[11] TEMPORARY BY-PASS, WAIT

Indicates that the load is powered by the by-pass line and that the system is about to automatically return to normal operation, where the load is powered by the inverter.

This transitory phase occurs, for example, when the machine has just been switched on, or when it is waiting to return to inverter mode after having been switched to by-pass mode due to an overload.

[12] BY-PASS FOR OUTPUT OVERLOAD (fixed or flashing message)

If the message is flashing then the alarm has been memorised.

Indicates that the by-pass line overload has been memorised.

The overload must persist for a certain amount of time in order for it to be memorised.

[13] BY-PASS COMMAND ACTIVE; 8=COMMAND OFF

This alarm is present when the system has been deactivated and switched on to by-pass mode using the appropriate command on the keypad. The command is memorised even if the system is shut down due to insufficient power supply.

When the power supply returns, the system will not return to normal operation until this command has been removed.

[14] REMOTE BY-PASS COMMAND: ACTIVE

This alarm is present when the system has been deactivated and switched on to by-pass mode using the appropriate command connected to the “remote command and signal” connector (EPO).

The command is not memorised and the system will return to normal operation when the command is removed, assuming that there is a stable power supply to the system.

[15] OVERTEMPERATURE OR FAN FAILURE

This alarm is activated when the temperature of the system card, the inverter power modules, the rectifier power modules or the output filter chokes exceeds the maximum permitted value.

– This may be caused by the system operating temperature in an environment where the ambient temperature is too high.

[17] INPUT PHASE SEQUENCE NOT OK

Indicates that the input phase sequence on the by-pass line is incorrect.

[18] OUTPUT OFF, CLOSE SWOUT OR SWMB

This alarm occurs when there is no output voltage as both the SWOUT and SWMB switches are open at the same time.

[19] SYSTEM OFF COMMAND ACTIVE; 8=DI-ACTIVE.

This alarm is present when the total shutdown command has been activated using either the control panel or the RS232 connection.

The system carries out the command after a delay of several seconds, giving the user time to cancel the command, if required.

The command is memorised even when the system is shutdown due to insufficient power supply.

[20] REMOTE SYSTEM OFF COMMAND: ACTIVE

As per the alarm above, but with the command activated via the "REMOTE" connector. (EPO)

[21] MEMORY CHANGED: CODE = number

Code 1 the memory has been changed and the system functional parameters have returned to their default setting.

NOTE: codes other than 1 may appear temporarily without affecting the normal operation of the system.

[22] AUTO-OFF Timer: Toff= 0: 0', Ton= 0: 0'

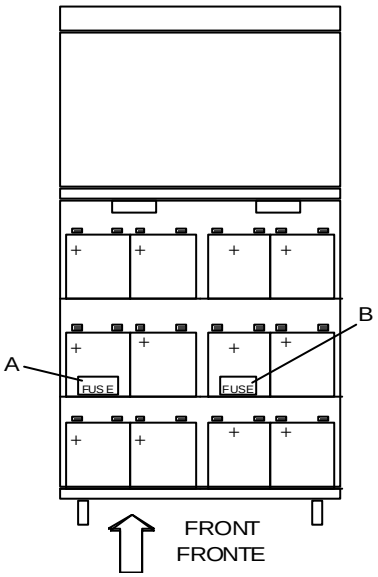
This alarm is activated as the machine starts counting down, when it is about to be switched on or off as part of the on-off cycle set using the daily timer.

The timer is normally deactivated.

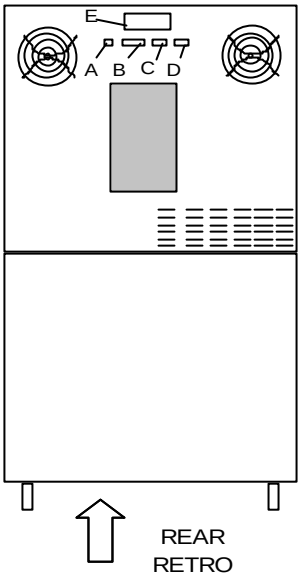
11 - VIEWS OF THE UPS

11.1 Front and rear view of the UPS

FRONT VIEW (10÷20 kVA)



REAR VIEW (10÷20 kVA)



12 - TECHNICAL DATA

12.1 Models

MODEL	POWER	BACK-UP cosfi 0.8	BACK-UP cosfi 0.7	DIMENSIONS (HWD) mm	WEIGHT kg
GREEN POINT	10kVA/8kW	0	0	1200x450x750	90
		8	10		180
		11	13		200
		15	17		218
GREEN POINT	15kVA/12kW	0	0	1200x450x750	95
		8	10		230
		11	13		275
		15	17		285
GREEN POINT	20kVA/16kW	0	0	1200x450x750	110
		7	9		245
		10	12		300

12.2 Back-up expansion modules

MODEL	BACK-UP factor 0.8	BACK-UP factor 0.7	DIMENSIONS (HWD) mm	WEIGHT kg
GREEN POINT 10 kVA	30	35	1200x450x750	160
	40	46	1200x450x750	160
	65	75	1200x555x720	563
GREEN POINT 15 kVA	30	35	1200x450x750	240
	35	40	1200x450x750	240
	40	46	1200x450x750	240
	65	75	1200x860x720	845
GREEN POINT 20 kVA	30	35	1200x450x750	240
	40	46	1200x450x750	240
	45	55	1200x860x720	845
	60	70	1200x860x720	845

12.3 Summary data sheets of models 10-20kVA

MODEL	10000		15000		20000	
INPUT	Single-phase input	Three-phase input	Single-phase input	Three-phase input	Single-phase input	Three-phase input
Input phases	1 (single or three-phase input selectable on site)	3 (single or three-phase input selectable on site)	1 (single or three-phase input selectable on site)	3 (single or three-phase input selectable on site)	1 (single or three-phase input selectable on site)	3 (single or three-phase input selectable on site)
Rated voltage	220-230-240V	380-400-415V	220-230-240V	380-400-415V	220-230-240V	380-400-415V
Maximum input voltage before battery intervention	276V	480V	276V	480V	276V	480V
Minimum input voltage before battery intervention (applied load 100%)	184V	320V	184V	320V	184V	320V
Rated frequency	50/60Hz with auto sensing					
Maximum current	51	18	67	26	74	35
Rated current	39	13	59	20	78	26
In-rush current	< In					
Power factor	0.99	0.95	0.99	0.95	0.99	0.95
Current distortion (THDi)	< 7%	< 27%	< 7%	< 27%	< 7%	< 27%
"Hold up" time (acceptable mains supply interruption before battery intervention)	20 ms					
BY-PASS						
Maximum voltage acceptable for switching to mains	+ 15%					
Minimum voltage acceptable for switching to mains	-15%					
Voltage tolerance configuration (from the control panel)	From ± 5% to ± 25% (5% steps)					
Rated current	43A	43A	65A	65A	87A	87A
Maximum frequency tolerance accepted for switching to mains	+ 5%					
Minimum frequency tolerance accepted for switching to mains	-5%					

MODEL	10000		15000		20000	
INPUT	Single-phase input	Three-phase input	Single-phase input	Three-phase input	Single-phase input	Three-phase input
Frequency tolerance configuration (from the control panel)	±5% (1% steps)					
Switching time (mains to inverter synchronised)	Null					
Switching time (mains to inverter not synchronised)	Null					
Switching time in the Economy /Smart Active mode (by-pass to inverter)	<1ms					
By-pass protection	Fuse 50A/gR	Fuse 50A/gR	Fuse 63A/gG	Fuse 63A/gG	Fuse 100A/gG	Fuse 100A/gG
Back-feed protection	STANDARD					
BY-PASS OVERLOADS (xIn)						
1h	1.6	1.6	1.4	1.4	1.7	1.7
10’	1.8	1.8	1.6	1.6	1.9	1.9
1’	2.8	2.8	2.6	2.6	2.9	2.9
1s	5.1	5.1	5.4	5.4	7.4	7.4
10ms	20	20	20	20	28	28
Efficiency	>99%					
BATTERY						
Back-up in mins (factor 0.7) (internal batteries)	From 0 to 17’					
Back-up in mins (factor 0.8) (internal batteries)	From 0 to 15’					
No batteries	32	32	48	48	48	48
Battery rated voltage	384	384	576			
Type of battery	Sealed lead, high efficiency, maintenance-free					
Battery configuration	In series with mid point connection					
Recharge current	4A minimum					
Recharge time	From 4 to 8 hours depending on back-up					
Intervention time (mains absent)	Null					
Rated voltage on expansion connector	384V	384V	576V	576V	576V	576V
Rated output supplied	8.9kW	8.9kW	11.7kW	13.3kW	13.3kW	17.8kW
Rapid recharge voltage	442V	442V	662V	662V	662V	662V

MODEL	10000		15000		20000	
INPUT	Single-phase input	Three-phase input	Single-phase input	Three-phase input	Single-phase input	Three-phase input
Floating voltage	434V	434V	650V	650V	650V	650V
End discharge voltage	320V	320V	480V	480V	480V	480V
Battery voltage compensation for temperature	-2,6 mV/°C per element					
Battery ripple current	0.5% C10					
Battery voltage stability (batteries charged)	< 1%					
OUTPUT						
Number of phases	1	1	1	1	1	1
Rated voltage	230V	230V	230V	230V	230V	230V
Phase/neutral voltage variation range (from control panel)	From 200 to 243V					
Waveform	Sinusoidal					
Frequency	50/60Hz selectable					
Frequency converter function	YES					
Stand-by function (load powered only when mains absent)	YES					
Current peak factor (from EN50091-3 regulation)	3:1					
Output power with input voltage within tolerance of ± 30%	100%					
Output power with input voltage within tolerance of ± 40%	60%					
Output power with input voltage within tolerance of ± 60%	40%					
Rated output (VA)	10kVA	10kVA	15kVA	15kVA	20kVA	20kVA
Rated output (W)	8kW	8kW	10.5kW	12kW	12kW	16kW
Static variation	< 1%					
Dynamic variation (with load impact from 0 to 100%)	< 5%					
Output frequency variation with mains absent	0.05%					

MODEL	10000		15000		20000	
INPUT	Single-phase input	Three-phase input	Single-phase input	Three-phase input	Single-phase input	Three-phase input
Output frequency variation with mains present	2% (selectable)					
Output frequency variation (from display panel)	From 1 to 5%					
Frequency variation velocity (Hz/sec.)	2 Hz/sec					
Voltage reset after dynamic variation	< 10ms					
Voltage distortion (linear load)	< 2%					
Voltage distortion (non-linear load)	< 5%					
OVERLOAD						
100% < Load < 110%	5h					
110% < Load < 125%	10’					
125% < Load < 150%	1’					
Short circuit current (t < 0.5 sec.)	3In					
Short circuit current (phase/neutral)	3In					
Inverter efficiency	94%	94%	94%	94%	94%	94%
VARIOUS						
AC/AC efficiency (double conversion function)	92%					
AC/AC efficiency (Line interactive function)	98%					
Maximum permanent operating temperature	40°C					
Ambient operating temperature	40°C					
Recommended operating temperature (for the batteries)	20/25°C					
Humidity	95% without condensation					
Maximum altitude for installation	1000m					
Derating for altitudes above the rated value	-1%Pn every 100m above 1000m					

MODEL	10000		15000		20000	
INPUT	Single-phase input	Three-phase input	Single-phase input	Three-phase input	Single-phase input	Three-phase input
Compliance with safety regulations	EN62040-1 Directive 73/23/EEC and 93/68/EEC					
EMC compliance	EN50091-2 cl. A, directive 89/336/EEC					
Immunity to sudden current surges	6kV 300J in accordance with IEC61000-4-5					
Noise	<56dB(A)					
DIMENSIONS						
Height (mm)	1200					
Width (mm)	450					
Depth (mm)	750					
Weight in Kg (without integrated batteries)	90	90	95	95	110	110
Max weight in Kg (with integrated batteries)	218	218	285	285	300	300
Mechanical characteristics	Shielded metal cabinet with an applied plastic frontal display					
Level of protection	IP205					
Resistance to vibrations(G)	<2					
Power dissipated with load (W/Cal)	640/550	640/550	840/826	960/826	960/826	1280/1101
Power dissipated no-load (W/Cal)	150/129	150/129	200/172	200/172	250/215	250/215
Ventilator range for removing heat	320 mc/h	320 mc/h	480 mc/h	480 mc/h	480 mc/h	480 mc/h
Colour	Light grey RAL7035					
Input differential current	<100mA					
Protections	Thermal on system, rectifier, by-pass and inverter. Protection against profound battery discharge.					
Output protection figures (recommended values for selectivity)						
Normal fuses (GI)	In (rated current)/7					
Normal circuit breakers (curve C)	In (rated current)/7					
Ultra-rapid fuses (UR-URG)	In (rated current)/2					
Cable input	Front from rear					
Input connections	On terminals					
Output connections	On terminals					
Cooling	Forced variation varying with load and ambient temperature					

MODEL	10000		15000		20000	
INPUT	Single-phase input	Three-phase input	Single-phase input	Three-phase input	Single-phase input	Three-phase input
Standard remote signals	3 volt free contacts/double serial line/EPO input + by-pass					
Information available on display						